DOER report

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The Commonwealth of Massachusetts

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2002 Energy Efficiency Activities in Massachusetts

Division of Energy Resources

Commonwealth of Massachusetts

Office of Consumer Affairs and Business Regulation

Introduction

Enacted as part of the 1997 Electric Industry Restructuring Act ("the Act"), Massachusetts law requires customers of the electric distribution companies to pay a charge to support energy efficiency programs. These programs can: lower the overall cost of electricity without reducing comfort or convenience, lower the emission of harmful air and water pollutants, create jobs, and stimulate the economy. The investments provide for the installation of high efficiency lighting, motors, air conditioners and appliances; the construction of high-efficiency homes and commercial buildings; and more.

This summary provides an overview of the Division of Energy Resources' ("the Division") fifth annual legislative report on the status of ratepayer-funded energy efficiency activities in the Commonwealth, and the extent to which the statewide energy efficiency goals are being met.

Highlights

- ***Energy efficiency programs improved reliability and lowered retail electricity prices through demand reduction by almost $1.2 million in 2002.***
- ***Participants saved over $21.5 million on their 2002 electric bills. These bill savings are projected to grow to approximately $249 million over the lifespan of the installed measures.***
- ***Participating customers and ratepayers invested $138 million in 2002 to achieve the savings.***
- ***Energy efficiency investments created an estimated 1,778 new jobs, contributing $139 million to the gross state product in 2002. An additional 315 jobs will result from bill savings over the lifetime of these investments.***
- ***Energy efficiency programs improve air quality in Massachusetts and the New England region.***

Energy Efficiency Programs Summary
1998-2002

Customer Sector	Number of Participants	Total Expenditures (in millions)	Total Annual Bill Reductions (in millions)	Total Lifetime Bill Reductions (in millions)
Low-Income	95,478	$60.3	$4.3	$57.3*
Residential	924,428	$193.6	$30.1	$397.3
Commercial	25,483	$414.1	$73.5	$971.4
Total	1,045,389	$668	$108	$1,426

*****Annual and Lifetime savings are for electricity only. DOER has not included the additional oil savings that these energy efficiency funds provide to low-income households through investments that improve buildings and heating systems.*

Listed below are the specific objectives of these programs under the Statewide Energy Efficiency Goals.

Energy Efficiency Operational Objectives:

(1) Reduce the use of electricity cost-effectively (as determined by the Department of Telecommunications and Energy).
(2) Ensure that energy efficiency funds are allocated to low-income customers consistent with the requirements of the Act, and allocated equitably to other customer classes.

Energy Efficiency Programmatic Objectives:

(3) Reduce customer energy costs by balancing funding of programs that provide short-run savings vs. those that produce long-run savings.
(4) Support the development of competitive markets for energy efficiency products and services.

The following report chronicles the fifth year of the energy efficiency programs designed to meet these objectives.

2002 Participants Saved Over $21.5 Million On Their Electric Bills

Program participants saved over $21.5 million on their 2002 electricity bills. Largely as a result of lower standard offer and default service prices for electricity in 2002, savings decreased by $6.5 million as compared to 2001. Cumulative dollar savings are projected to grow to approximately $249 million over the full lifetime of the measures installed in 2002, assuming that the energy efficiency equipment remains in place (an average of almost 14 years). Collectively, participants saved an average of 6 percent on their 2002 electricity bills. Table 1 represents what the typical customer saved in each sector.

As in previous years, program participation levels in 2002 varied greatly among the different customer sectors (see Table 2). Low-income customer participation rates were 4 percent, based on an eligibility threshold of 60 percent of the Median Income. Comparatively, residential non low-income participation levels were three times that of low-income customers, at 15 percent of total eligible households. Large Commercial and Industrial (C&I) customers continue to have a high participation rate, reflecting that large electricity users reap the greatest savings (as a percent of their total operating costs) by improving the efficiency of their facilities, while often participating in programs more than once a year. Small C&I customers, and to a lesser extent Medium C&I customers, continue to have the lowest participation rates despite potential bill savings and efforts to target these customers. Various market barriers to energy efficiency investment, including a lack of energy management resources, account for these lower rates.

Table 1: 2002 Average Bill Impacts from Energy Savings

Customer Class	Total Annual Bill Reductions for Participants	Avg. Annual Bill Savings per Participant
Low-Income	$744,617	$34
Residential	$6,215,505	$30
Small C&I	$3,691,091	$1,106
Medium C&I	$4,287,686	$2,629
Large C&I	$6,470,433	$7,639
Total/Average	$21,469,342	$92

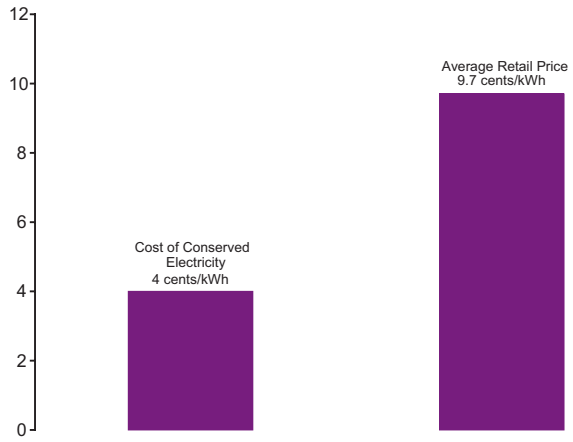
Table 2: 2002 Energy Efficiency Program Participation

Customer Sector	# of Participants	% Served
Low-Income	21, 748	4
Residential	219,333	15
Small C&I	2,897	1
Medium C&I	2,124	3
Large C&I	831	14
Total/Average	246,933	10

The Cost To Conserve Electricity Is Nearly 59 Percent Less Than The Cost To Buy It

Ratepayer funds financed $113 million in energy efficiency program activities in 2002, while participants contributed another $25 million for a total of $138 million. An estimated 3,428 million kilowatt-hours will be saved over the lifetime of these investments. On average, this represents a cost of conserved energy of 4.0 cents/kWh for program participants – 59 percent less than the projected average retail electricity price of 9.7 cents/kWh (in 2002 dollars) over the same period. Figure 1 illustrates this comparison.

Figure 1: Cost of Conserved Electricity vs. Average Retail Price



Energy Efficiency Investments Creating Jobs in the Commonwealth

Energy efficiency activities promote the expansion of Massachusetts energy efficiency industries and other industries in the state. The Division's economic model estimates that 2002 ratepayer-funded investments in energy efficiency will create 1,778 new jobs in Massachusetts, contributing $139 million to the gross state product. In addition, the state economy will gain $64 million in disposable income from these jobs, most of which will be realized in the short-term. Services, retail trade and manufacturing constitute most of these jobs.

Energy efficiency activities have longer-term impacts through bill savings to both residential customers and businesses. For example, residential customers can spend their savings on other consumption goods. Businesses become more competitive and can re-invest the savings. These economic impacts last over the lifetime of the energy efficiency measures. In addition, the Division estimates that the lifetime bill savings generated 315 permanent jobs. As a result, the Division estimates increases to gross state product and disposable income of $22 million and $15 million, respectively, over the lifetime of the measures.

The Competitive Market for Energy Efficiency Services Contracts

Observing the extent to which competitive retail suppliers provide customers with products and services is an indicator whether the competitive market for energy efficiency services has developed in Massachusetts. Limited supplier activity in the retail electricity market continues to hamper the availability of energy efficient products and services from the competitive market. As such, customers continue to get most of their energy efficiency measures from the ratepayer-funded distribution company programs.

NSTAR's ENERGY STAR® Homes

Cambridge Park Place Multi Family ENERGY STAR® Homes

An ENERGY STAR® Homes project called Cambridge Park Place, Cambridge, MA has 312 individual residential units. This property received various energy efficient measures from the NSTAR Residential New Construction program. Installed measures at this project include ENERGY STAR® rated fixtures, ENERGY STAR® refrigerators and dishwashers, and mechanical ventilation. NSTAR also fully funded the cost of HVAC commissioning and the certification of the project as ENERGY STAR®.

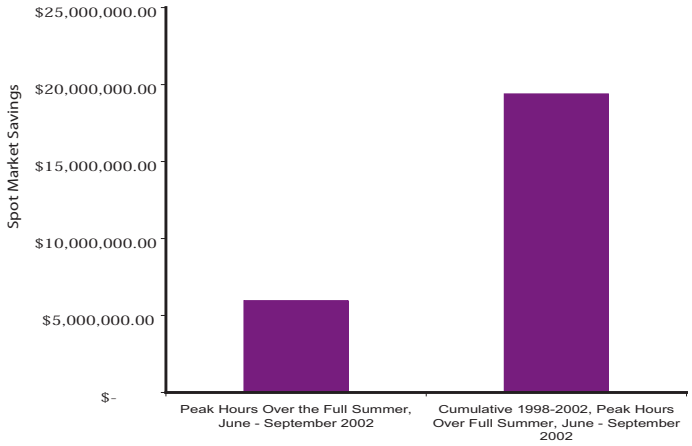
Total Project Cost: $352,287.
Estimated Annual Savings: 176,949 kWh or $55,337
Estimated Lifetime Savings: 3,431,964 kWh or $977,833

Competitive procurement of ratepayer-funded program services (e.g., program implementation) is another measure of a healthy energy efficiency market. The Act requires that program administrators to use competitive procurement processes to the greatest extent practicable when delivering programs to Massachusetts customers. These procurement processes benefit customers by providing lower, competitively set program costs. Competition also introduces innovative elements to program designs and/or implementation. In 2002, competitive procurement accounted for $93 million, or 82 percent of total energy efficiency expenditures administered by local distribution companies or municipal aggregators. This percentage of competitive procurements held steady with the previous year (83%).

Energy Efficiency Investments Improve Reliability and Lower Wholesale Electricity Prices

Load reductions help reduce wholesale energy prices. During those 10 to 100 hottest hours a year when demand is straining generation capacity to the limit, this is especially true. By reducing demand during peak usage periods, energy efficiency programs contribute to system reliability in terms of supply adequacy within a particular area or region and can enhance reliability of local transmission and distribution networks. This attribute is particularly important in Massachusetts where there is constrained transmission into areas in metropolitan Boston and the Cape and Islands. Energy efficiency programs lessen the costly likelihood of system failures by reducing load and demand on the power distribution network. The programs also help avoid higher wholesale energy clearing prices. The Division estimates, for example, that roughly $5.9 million in additional costs were avoided over the peak summer months (June to September) of 2002. The Division estimates total savings rises to $19.4 million, when considering the cumulative demand reduction impact in 2002 from energy efficiency measures installed over the period 1998 through 2002 (see Figure 2).

Figure 2: Potential Impact of Demand Reductions on the Energy Spot Market



Energy Efficiency Programs Improve Air Quality in Massachusetts and the New England Region

In year 2002, ratepayer-funded energy efficiency activities reduced the amount of air polluting emissions released by electricity generating units by reducing electricity demand. While specific Massachusetts-generated emissions are difficult to identify, overall emissions by the regional power system were reduced. The annual emission reductions for the three most critical pollutants – nitrogen oxides (NO_X), sulfur oxides (SO_2), and carbon dioxide (CO_2) – were 135 tons, 394 tons, and 161,205 tons, respectively (see Table 3). The drop in NO_X emissions reductions is roughly equivalent to the emissions of 10,206 passenger cars for an entire year. The SO_2 emission equate with burning 28,053 fewer tons of bituminous coal, the primary type of coal burned for electricity generation. The 161,205 tons of reduced CO_2 emissions equal the annual emissions of 392 cars and light vehicles. The Division estimates that reduction of generation over the lifetime of energy efficiency measures installed in 2002 will lower emissions of these pollutants by 1,890 tons, 5576 tons, and 2,256,870 tons, respectively. Thus, the public will enjoy air quality benefits from 2002 energy efficiency activities over the long-term.

Table 3: Energy Efficiency Programs Reduce Annual Emissions

Pollutant	Environmental/Health Impact	Avoided Emissions (in tons)	
		Year 2002 Only	2002 Lifetime of Measures
Nitro Oxides (NO	Smog (respiratory health damage) and acid rain (damage to natural habitats, etc.)	135	1,890
Sulfur Dioxide (SO	Acid rain (damage to natural habitats, etc.) and acid aerosols (asthma & other respiratory health damage)	394	5,516
Carbon Dioxide (CO)	Global warming (climate change, with more extreme weather events, rising sea level, economic disruption, etc.)	161,205	2,256,870

Source: Division of Energy Resources Energy 2020 Model Analysis

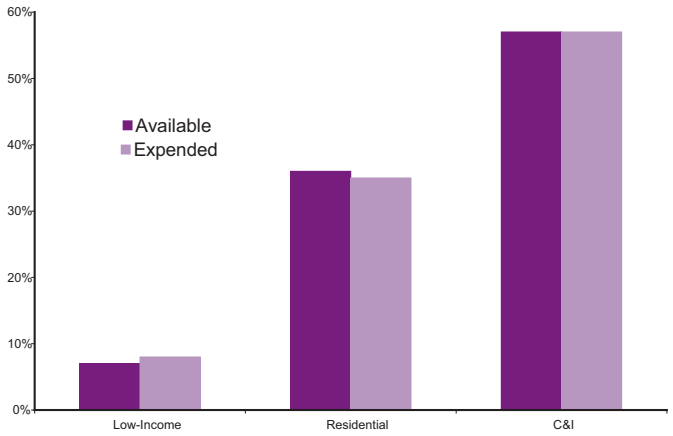
Summary of Energy Efficiency Funds Collected and Expended

Ratepayers contributed a total of $114.3 million during 2002 to support energy efficiency activities. The sum represents an average of 2.7 percent of customers' average annual electricity charges. Total Available Funds for 2002 numbered $122.5 million as Program Administrators carried forward $8.2 million of unspent funds from 2001. Total expenditures for 2002 were $113.5 million, leaving a year-end fund balance of $8.2 million (same as 2001).

Funds Equitably Allocated Across Customer Sectors

The Act directs the Division to ensure that ratepayer funding for energy efficiency is equitably allocated among customer sectors. The Act also directs that low-income program funding levels be at least 20 percent of the amount expended for residential programs, and no less than $0.00025 per kWh (based upon total kWh sold to all customers). In its analysis, the Division used 60 percent of the Median Income as its standard for participation eligibility for the low-income sector.

Figure 3: 2002 Available vs. Expended Funds



Note:"Available Funds" refers to 2002 collections from customer sectors and carry over funds from 2001. "Expended Funds" refers to 2002 expenditures plus year-end balances.

Available funds in year 2002 for the low-income, residential, and C&I sectors were 7 percent, 36 percent, and 57 percent, respectively. Spending closely tracked funding sources at 8 percent, 35 percent and 57 percent respectively. Comparing Available Funds, shows convincingly that the program expenditures, were equitably allocated (see Figure 3), with residential non low-income subsidizing low-income by 1%.

Program Activities Balance Short and Long-Term Savings

Ratepayer-funded energy efficiency programs served two fundamental purposes in 2002: they provided immediate savings for participating customers, while simultaneously laying the foundation for long-term savings for all customers by transforming energy efficiency markets.

Of the $113.5 million spent on energy efficiency activities in year 2002, Program Administrators targeted the greatest portion ($68.1 million) for Retrofit programs. These programs encourage the replacement of outdated and inefficient electrical and/or mechanical equipment, such as lighting, heating and cooling systems, motors, energy management systems, and process redesign/improvements. Customers can take advantage of financial rebates to upgrade to higher efficiency equipment.

Fitchburg Gas and Electric Light Company
Residential Low Income Retrofit Program

Fitchburg, MA
An energy audit on the home recommended a number of cost-effective improvements. Installed measures included ENERGY STAR® CFLs, an appliance timer for a room a/c and low-flow aerators and showerheads. A combustion safety test was performed on the home's gas boiler, identifying improper ventilation and excessive carbon monoxide in the home. To remedy this problem, a vent pipe or chase was installed in the chimney. Lastly, insulation, provided by a weatherization program, was added to the home's attic and basement to reduce the home's heat loss.
Project Cost: $595.10
Incentives: $595.10
Participant Cost: $0
Est. Annual Savings: 1,054 kWh; 0.2 kW, 246 Therms
Estimated Bill Savings
Electric: $52, Gas: $190
Lifetime: $4,800

The second largest portion of funding ($30.7 million) was spent on Lost Opportunity/New Construction programs. These programs focus on encouraging investment in higher energy efficiency at the time of a naturally-occurring market event, such as construction of a new home or building, major expansion, renovation or remodeling, or replacement of failed equipment. These programs not only provide immediate and long-term savings to participants through rebates, but also target key market players (e.g., architects, designers, and builders) in order to change standard building practice and to upgrade building codes and standards, benefiting all customers over the long-term.

Western Massachusetts Electric Company
Small Business Energy Advantage (SBEA)

Allston Supply, Springfield, MA
Allston is a growing distributor of chemical supplies, housed in a 15,000 square foot facility. This project retrofitted the existing T-12 HO fixtures (207 Watts) to T-5 (76 Watts), helping to transform the space from dark and dingy to bright and welcoming.
Project Cost: $10,830.00
Incentives: $5,806.00
Participant Cost: $5,024.00 (financed over two years via 0% SBEA Loan)
Estimated Annual Savings: 24 kW, 29,500 kWh per year and $3,000
Estimated Lifetime Savings: $60,000

Regional Market Transformation programs accounted for approximately 12 percent of expenditures ($13.6 million). Typically, Massachusetts distribution company administrators jointly implement these programs with coordination from the Northeast Energy Efficiency Partnership. While these programs provide some immediate savings to participating customers, their overarching purpose is to change the production, purchasing, design, and stocking practices of manufacturers, builders, engineers, architects, and retailers over the long-term. By transforming the market practices of these participants to promote purchases of higher energy-efficiency products and services, these programs improve long-term efficiency on a much larger scale than programs that focus on changing the behavior of end-use customers. The remainder of year 2002 expenditures ($1.1 million) went largely to educational programs for residential customers with a minor portion to miscellaneous products and services across all sectors.

Program Cost-effectiveness Improved in 2002

Using the methodology prescribed by the Department of Telecommunications and Energy ("the Department")] for determining program cost-effectiveness, Program Administrators determined that the 2002 ratepayer-funded programs were cost-effective. These programs registered an overall benefit-cost ratio of over 2 to 1. This ratio measures the value of energy efficiency program *savings* compared to the associated program *costs* from a total resource perspective. Specifically, benefits are the value of wholesale electricity, and distribution and transmission costs *avoided* by distribution companies, as well as other resource and non-resource benefits due to program savings over the lifetime of year 2002 installations. Costs are those expended on program activities in year 2002, including participant costs.

Cape Light Compact
Commercial & Industrial/Government
Traffic Signal Retrofit to LEDs

The Towns of Barnstable, Bourne, Brewster, Dennis, Falmouth, Harwich, Orleans, Sandwich, Truro and Yarmouth.
The retrofit to LED's of more than 900 traffic signal lamps operated by the ten participating towns and the State Mass Highway intersections were aggregated and competitively bid over the Fall/Winter period and installed by a single contractor in time for the busy Spring/Summer period on Cape Cod. As the project total cost presented significant savings and benefited all consumers, a 100% subsidy for municipal projects, was provided by the Cape Light Compact.
Project Cost: $114,000
Incentives: $114,000
Participant Cost: $0
Estimated Annual kWh Savings: 300,000
Estimated Annual Electric Bill Savings: $37,000
Estimated Lifetime Electric Bill Savings: $260,000

Program cost-effectiveness is measured according to Department guidelines. Beginning in 2000, the Department embraced a more expansive counting of benefits and costs, pursuant to its 98-100 Order. These additional benefits include increased worker productivity and property improvement for homeowners and businesses due to the installation of higher efficiency equipment. Energy efficiency investments also save distribution companies money by reducing such costs as bad debt expenditures and other costs that would be passed on to all customers. Further, customers accrue other resource savings such as reduced natural gas, oil and water bills. For example, an energy efficient clothes washer will not only reduce electricity costs to wash the clothes, but also lower the amount of water and if applicable, gas used to heat the water.

The Department's 98-100 Order directed that, beginning in year 2000, the value of "post program effects/savings" be considered in cost-effectiveness analyses for market transformation programs (see "Program Activities Balance Short and Long-term Savings"). These savings are expected to accrue to customers over the long-term after these programs end (i.e., due to the programs transforming the market for particular technologies). Early estimates of post program savings show substantial increases in program cost-effectiveness, resulting in an overall benefits-cost ratio of 2.6 to 1. The accuracy of these estimates is subject to further review by the Department.

Northeast Residential ENERGY STAR® Products Initiative:

Change in Market Share in Massachusetts

ENERGY STAR® Appliance	2001	2002
Clothes Washers	19%	25%
Dishwashers	19%	34%
Room Air Conditioners	25%	46%
Refrigerators	16%	25%

See Back Cover for Details

Conclusion

The Division concludes that 2002 energy efficiency program activities continued to effectively address the objectives of the Statewide Energy Efficiency Goals. The Programs realized substantial net economic benefit in two ways: first, in terms of bill savings to participating customers, and second, in system savings for all customers accumulated over the long-term from decreased costs in generation, transmission and distribution. The Programs also helped to curtail wholesale energy prices in the short-term, costs that would ultimately be paid for by all customers. Moreover, the Programs helped to create new jobs in the state both in the near term from investments in energy efficiency industries, and in the long term through continued bill savings over the lifetime of these investments. Finally, they reduced harmful emissions from fossil-fueled power plants, thus helping to improve air quality. These direct and indirect impacts of the energy efficiency programs continue to benefit the Commonwealth's economy and its citizens.

The Division also determined that more work is needed to ensure that a competitive market is created for energy efficiency products and services. Continued competitive procurement by Program Administrators will help provide the impetus for market development.

For further information on 2002 energy efficiency activities, including the full report, please visit the Division's web site: http://www.mass.gov/doer.

Massachusetts Electric Company
Large Commercial and Industrial
Energy Initiative

Brockton Water Dept / US Filter, Silver Lake Station - Pembroke MA
The Silver Lake Pumping Station pumps approximately 12 million gallons per day of municipal drinking water from Pembroke MA (elevation 59') to twin reservoir tanks in Brockton MA (elevation 250'). The focus of this project is to shift electrical demand from the on-peak period to the off-peak period, while still meeting operational requirements. Substantial water quality improvements are also being realized. Equipment included: HI lift pump with New Motor Control Centers, including Synchronous Motor Starters (2) 450 HP, and (2) 125 HP New Premium Efficiency Motors, Variable Speed Drives for each motor and SCADA Control System
Project Cost: $508,111.00
Incentives: $254,056.00
Participant Cost: $254,055.00
Estimated Annual Savings: 532,296 kWh or $45,000
Estimated Lifetime Savings: $675,000 (estimated on 15 year life)

Northeast Residential ENERGY STAR® Products Initiative:
Massachusetts Program Efforts Increase Market Penetration of High Efficiency Appliances in the State through Coordinated Efforts with other States in the Region

In 2002, the Massachusetts program administrators continued to play an active and lead role in the Northeast Residential ENERGY STAR® Products Initiative, facilitated by Northeast Energy Efficiency Partnerships, Inc. Their coordinated program efforts helped to increase the market share of high efficiency appliances sold at national chain stores in the state significantly compared to 2001. (Source: D&R International)

The utilities also held special promotional events to increase the sales of ENERGY STAR® appliances. For example, a 3-month advertising campaign with a local retailer, in partnership with NSTAR Electric and Massachusetts Electric Company, increased consumer sales of ENERGY STAR® clothes washers, dishwashers, and refrigerators by 21%, 19% and 30%, respectively, compared to the same period in the previous year. In a separate promotion, Western Massachusetts Electric and Massachusetts Electric partnered with a local appliance store, that funded instant rebates on ENERGY STAR® appliances while the utilities provided financial support for their advertising campaign, including print and TV ads. The promotion increased sales for the stores high efficiency appliances by an average of 110% compared to the same week in the previous year. In addition, Cape Light Compact hosted its first Annual Energy Fair in the fall of 2002, where it provided the opportunity for Cape and Island residents to recycle inefficient air conditioners and dehumidifiers as well as purchase high efficiency ENERGY STAR® lighting, helping residents save over 290,000 kWh per year.

These promotional efforts, which send a consistent and uniform message about ENERGY STAR® products to customers throughout Massachusetts — and which are coordinated with other program administrators in other Northeast states — are helping to transform the market for high efficiency appliances in the region and bringing important energy savings to customers. They also produced an estimated lifetime kWh savings of Nearly 30 million kWh. (Source: Nexus Market Research)

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http://www.mass.gov/doer
Suggestions and comments can be e-mailed to
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